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SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

Author: Mr. Peter Visscher
Ontario Drive and Gear, Canada, pvisscher@odg.com

Mr. Perry Edmundson
Ontario Drive and Gear, Canada, pedmundson@odg.com
Dr. Nadeem Ghafoor
Canadensys Aerospace Corporation, Canada, nadeem.ghafoor@canadensys.com
Dr. Howard Jones
Canadensys Aero, Canada, howard.jones@canadensys.com

LATEST DEVELOPMENTS IN CANADIAN LUNAR ROVER PROTOTYPES

Abstract

Purpose: to describe the recent efforts of Ontario Drive and Gear Ltd. (ODG) and its partners (including Canadensys Aerospace Corporation) in developing two new lunar rover prototypes for the Canadian Space Agency (CSA). Delivered in the first half of 2016, these vehicles demonstrate the compatibility of the ODG rover architecture with higher Technology Readiness Levels (TRLs), including a TRL-6 drivetrain, as well as next-generation semi-compliant metallic wheels that are designed to remain compliant over a wide thermal range.

Methodology: In late 2014, ODG and its partners commenced development of two rover prototypes for CSA: the Lunar Rover Platform and Drivetrain Prototype (LRPDP) and the Small Planetary Rover Platform (SPRP). Both of these rovers build on ODG's significant heritage from several previous generations of lunar rover prototypes, including Juno and Artemis Jr., which were used by CSA and NASA in multiple analogue deployments starting in 2010.

LRPDP is a mid-size mobility platform characterized by a robust, simple architecture that places an emphasis on functionality in extreme terrain such as soft regolith, steep slopes, and rocky surfaces. All sensitive components such as motors, gearboxes, and avionics are located in sealed compartments for thermal control and dust contamination protection. The chassis design accommodates a large payload in the center of the rover footprint. The rover mass is 112 kg with an allowable payload of up to 160 kg.

SPRP is similar to LRPDP, but is optimized for smaller size. It features a unique chassis designed to provide both thermal and contaminant protection for the avionics and power systems while providing quick access to payloads during testing. It also includes a reconfigurable suspension. The vehicle mass is 94 kg with an allowable payload of 50 kg.

Results: TRL-6 thermal vacuum testing of a drivetrain assembly was conducted at NASA Glenn Research Center (GRC) in Cleveland, Ohio in late 2015. The VF13 vacuum chamber used at GRC allowed the equipment to be tested with lunar simulant present under exposure to thermal extremes. The drivetrain assembly performed as designed during the test.

Analog performance testing was also conducted on both LRPDP and SPRP, equipped with next-generation semi-compliant metallic wheels. The rovers performed as designed.

Conclusions: LRPDP and SPRP, the latest generation of Canadian lunar rover prototypes for the CSA, provide highly-capable and cost-effective platforms that represent the next step in the development of a fully flight-qualified Canadian lunar rover for a future mission.